**Mathematical Skills**

**Scientific Notation**

An exponent is used to show the power to which another number or symbol is to be raised. The exponent shows the number of repeated multiplications of the base.

Example: 102 = 10 x 10

Why use exponents? Exponents are used to avoid mistakes when writing really large or small numbers.

Example: Write 104 000 000 in scientific notation.

Example: Write 0. 000 001 99 in scientific notation.

Practice:

1. Put the following values into scientific notation:
2. 58 000 000
3. 260.7
4. 25 000
5. 0. 000 000 04
6. 0. 005 6
7. 400 000 000 000
8. Convert the following from scientific notation to standard form:
   1. 1.2 x 103
   2. 5.0 x 101
   3. 7.4 x 102
   4. 6.0 x 10-4
   5. 3.9 x 10-8
   6. 2.3 x 109

**Significant Digits**

Measurements are estimates, not exact quantities. No measuring device is 100% accurate. There is always uncertainty in the measurement.

Significant digits are used to show the amount of uncertainty in a measurement. You include all the certain digits plus 1 uncertain digit. For example, when measuring with a ruler, you can only be certain to 0.1 cm. You must estimate the distance between mm marks. If you estimate the length of an object to be 4.35 cm, you can only be certain of the first 2 digits (4 and 3) but the last digit, 0.05 was estimated. The measurement 4.35cm has 3 significant digits.

Determining the Number of Significant Digits

1. All non-zero digits are significant

Examples:

595 m: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

50.45 cm: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Zeros between non-zero digits are also significant

Examples:

13095 m: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

40.3 km/h: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Any zero that follows a non-zero digit (right) is significant

Examples:

40.60 mm: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.0 km: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Zeros used to indicate the position of the decimal are not significant (spacers):

Examples:

500 km: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

0.500 m: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

0. 000 40 cm: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. All counting numbers have an infinite number of significant digits

Examples:

6 chocolate bars:

50 people:

Practice:

1. Determine the number of significant digits in each measurement:
   1. 25 g
   2. 584 mL
   3. 0.003 56 km
   4. 505.2 m
   5. 1.030 L
   6. 0.0070 kg

**Rounding**

When you use measured values the calculated answer cannot be more certain than the measurement on which it is based. Often, you need to round to the correct number of significant digits.

Rules for Rounding:

1. When the first digit to be dropped is less than 5, the preceding digit is not changed.

Example: Round 6.723 m to 2 significant digits \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. When the first digit to be dropped is 5 or more, the preceding digit is increased by one.

Example: Round 7.239 to 3 significant digits \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

When you perform a mathematical operation, round the final answer to the correct number of significant digits (use the fewest significant digits in the question to guide you).